APRIL
1969
45¢

Live Steam®

THE MONTHLY MAGAZINE FOR ALL LIVE STEAMERS AND LARGE-SCALE MODEL RAILROADERS

Mid-South Live Steamers

METALS for the apprentice

Live Steam magazine

APRIL 1969 VOL. 3 NO. 4

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COVER PHOTO

Pulling on those gloves is nothing out of the ordinary for Lynn Lowe of Kingsport, Tennessee, who is an engineer on the Clinchfield R. R. We'll bet there is a special thrill, though, as he gets ready to head his 1½" 0-6-0 onto the main line at Austin Barr's track in Arkansas. Last fall, Lynn became the proud owner of this Burlington switcher built by R. C. Lippens of Kewanee, Illinois. Photo by C. E. Hull.

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Cadillac, Michigan 49601

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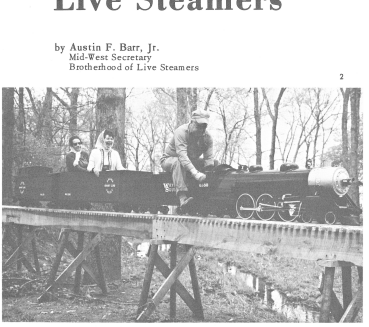
1

Increased activity evident at

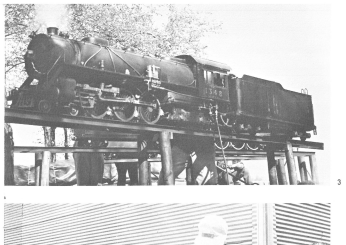
Mid-South Live Steamers

by Austin F. Barr, Jr.
Mid-West Secretary
Brotherhood of Live Steamers



2

PHOTOS 1, 2, 3, 4, 5 BY JOHNNIE M. GRAY
PHOTO ON COVER, 6, 7 BY CLIFTON E. HULL

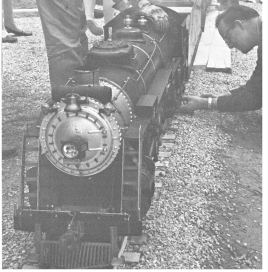


At the Mid-South Live Steamers' Spring Meet at Austin Barr's track in Whitehall, Arkansas, on April 11th, 12th and 13th, seven 1½" engines were under steam and two under construction were exhibited. Engines and Engineers were in attendance from a 600-mile radius.

For those who had attended last year's meet there were several surprises in store. A 34' tunnel; 1900' of new track winding through very scenic surroundings and over two 150' trestles; a hydaulic turntable and four steaming tracks with air, water and electricity and plenty of soft water for boilers.

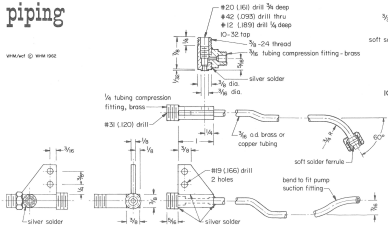
At a dinner meeting on Saturday night, sound-on-film movies of the 1968 meet were shown.

Photos were taken as Austin Barr tends to lubrication (1) while raising steam on his 1½" Pacific. Later in the day C. L. "Lou" Bandy of the Cincinnati Cinder Sniffers took the throttle (2) to put the engine through its paces. The husky Hudson building up steam on the steaming track (3) is far from its original base. Built by the late Ray Teerling in California it was purchased by Ira Kelly of Kansas who brought it on to Arkansas for this meet! Leo Myers of St. Louis and Don Barr (4) service Leo's "C. P. Huntington" while H. M. Buettner of Cullman, Alabama, takes photographer Johnnie Gray (5) around the track behind his 4–6–2. Early morning activity at the steaming bay (6) shows (l to r) John Collins inspecting Austin Barr's Pacific, Les Burford of Dallas taking pictures, Ira Kelly with his 4–6–4, Lou Bandy of Cincinnati and Paul Craft of Columbia, Tennessee, steaming up Paul's Pacific, and Lynn Lowe on the main line with his 0–6–0. While Paul Craft looks over his Pacific, Bob Wilson (7) checks the injector and P. L. "Bud" Bartholemew's 4–6–0 waits behind.

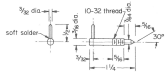


piping

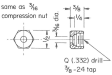
WHM/wcf © WHM 1962



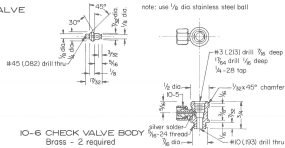
10-1 PUMP SUCTION LINE AND BY-PASS VALVE
Brass - 1 required



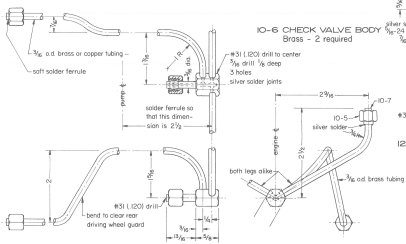
10-2 BY-PASS VALVE STEM
Stainless Steel - 1 required



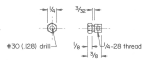
10-3 BY-PASS VALVE NUT
Brass - 1 required



10-6 CHECK VALVE BODY
Brass - 2 required



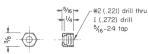
10-4 PUMP DISCHARGE LINE
Brass - 1 required



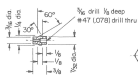
12-4 THROTTLE NUT
Brass - 1 required

12-6 THROTTLE LINK
Steel - 2 required

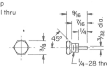
12-9 THROTTLE SPRING
.020 Music Wire - 1 req'd.



10-5 CHECK VALVE NUT
Brass - 4 required



10-7 CHECK VALVE SEAT
Brass - 2 required



10-8 CHECK VALVE PLUG
Brass - 2 required

building the RARITAN

accessories

by William H. Morewood

To make nice smooth bends in the Pump Suction Line (10–1) the tubing should be annealed and then bent either with a tube bender or with your fingers. Don't use pliers as they will nick it or kink it. If it becomes too hard to bend, anneal it again.

The Bypass Valve in the Pump Suction Line (10–1) is opened when the boiler water level is too high. It cuts off the feedwater by allowing the pump discharge to flow back into the pump suction line.

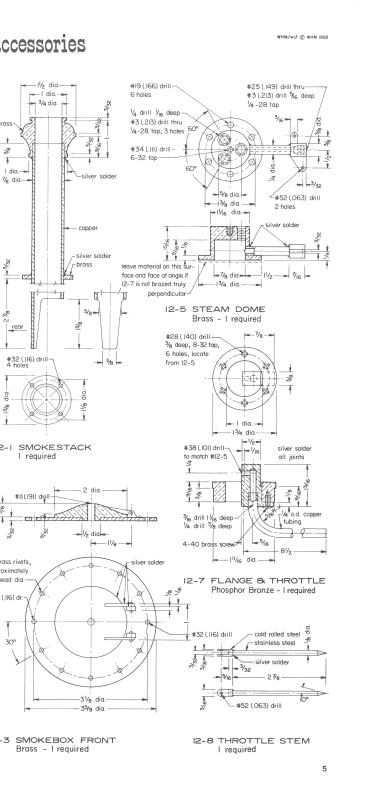
The Smokestack (12–1) is positioned so that the projection at the bottom of the stack is located at the rear of the smokebox. This acts as a baffle to prevent those sparks coming through the center flues from being blown directly out the stack by the exhaust blast.

You may prefer a diamond or a top-shaped stack and either would be appropriate for an engine of this period. If you put a screen on top, it should be removable for running as it will reduce draft.

In working up the Steam Dome (12–5), take care to silver solder the throttle tube square and straight. The small 3/16 wide bracket on the side of the packing gland is for a tension spring. Steam pressure tends to make the throttle fly open and the spring is used to hold it closed.

The Throttle Links (12–6) should be held in place with round head brass nails. Cut the nails so that 1/16 projects beyond the links and squeeze this end flat with a pair of flat-nose pliers. If you have an old pair, shorten the jaws until they are only 1/8" long and grind off the outside of the jaws as required. Bottom the brass nail right in the throat of the pliers and it may then be easily flattened.

The parts of the Flange and Throttle (12–7) are silver soldered with Sil-Fos. After the flange has been silver soldered into the boiler and the dome installed, you may find that the valve stem does not seat tightly. If so, make a steel rod like the valve stem, slip it through the packing in the gland until it seats in the port. Rotate it and strike it lightly with a small hammer. Remove it and again try the valve stem.



The author of our new column, "For The Apprentice," is Dr. Jack McKenty who is a comparative newcomer to the ranks of Live Steamers.

He was born in Canada, became a doctor, is married and has two children. His interest in model engineering dates 'way back but he was unable to do more than read about it until he moved to the United States about ten years ago.

Jack's tools and equipment are paid for, he says, by his daytime "trade" of Urology (he's a medical plumber) and his other interests include electronics (WA9SGB on 6 meters.)

Through his initiating efforts, the Milwaukee Light Engineering Society was organized and Dr. McKenty serves as its Secretary. He will appreciate comments, criticism and suggestions but cannot enter into personal correspondence and may be reached through the LIVE STEAM Magazine mailing address.

METALS for the apprentice

by Jack D. McKenty, M.D.

Brass

Brass is an alloy of copper and zinc and the proportions vary according to the use. Free-cutting brass is the standard by which the machinability of most other metal is judged; it consists of Copper 61%, Zinc 36% Lead 3%. A small amount of lead is added to many metals to increase machinability. Brass can easily be soft-soldered or brazed but does not take to being gas or arc welded. The higher temperatures tend to burn out the zinc.

Other forms of brass include Cartridge Brass (Copper 70%, Zinc 30%) also known as Deep Drawing Brass, Grommet Brass, Spring Brass and Spinning Brass. The names tell the uses. Muntz Metal is also known as Yellow Metal, Washer Brass, Burr Brass and Check Brass and is Copper 62%, Zinc 38%. It is often used commercially for its appearance which is bright yellow. Commercial Bronze is technically a brass, Copper 90%, Zinc 10%. It is typical bronze color and, again, is often used commercially for its appearance.

When not otherwise specified, the word brass usually refers to the free-cutting or free-machining form. It is wonderfully easy to work with, takes a high finish and resists corrosion. It is also easy to dent, scratch and bend and has all the long wearing qualities of balsa wood. Models which are to be used and handled nearly always require something stronger but it is still in common use for small models and for parts of large models not subject to wear.

Bronze

Technically, bronze is an alloy of copper and tin. In practice, the name has come to refer to almost any copper alloy which contains tin, even in small proportion, or any bronze-colored alloy even if it has no tin at all. Examples: Commercial Bronze as noted above and Olympic Bronze (Copper 96%, Silicon 3%, Manganese 1%). Bronzes are chiefly used for bearings, especially Phosphor Bronze (Copper 95%, Tin 4.75%, Phosphorus .25%).

Gunmetal

This is an English alloy of copper, zinc and tin, sometimes with added lead to increase machinability. Its strength and durability can be realized from the fact that it was actually used to make cannon. English modelers use it for cylinders and other parts which are similarly stressed. No American salesman of non-ferrous metal ever heard of it, but a close approximation is #444 Bronze (Copper 88%, Zinc, Tin and Lead 4% of each).

Copper

The red metal. It is an element, not an alloy, and is used chiefly for small boilers and heat exchangers. It is classified as a semiprecious metal and its expense precludes its use in large boilers. Special deoxidized copper is available for welding. If ordinary copper is welded, the area adjacent to the weld is porous and weak. Fortunately, it is available in many sizes of seamless tube and need not be welded. Well-made brazed joints have the strength of the parent metal with no weakness near the joints.

Cast Iron

There are several forms of cast iron. When not otherwise specified, "Grey Iron" is usually meant. This is iron with a few percent of silicon to reduce the 3% of carbon which is also present to a graphite form. It is the common material for castings; it machines well, and can take a beautiful mirror finish. Poorly made castings, especially those which are made from remelted iron and which may have inadequate amounts of silicon, may contain "chilled" areas. These are areas of hardness which can take the teeth off a hacksaw or file cut off a tool-bit in one pass. The chilled iron can not be softened except by rather elaborate heat treating.

Cast iron without the silicon is known as "White Iron." After heat treatment during which the castings "soak" at a high temperature for twenty-four hours) it becomes very strong and tough and is known as "Malleable Iron." Your vise is probably made of malleable iron.

Meehanite is a cast iron which contains nickel, often as much as twenty per cent. It makes wonderful castings and is also very good for bearings since it is porous enough to hold oil. It is also more resistant to rust than ordinary gray iron.

Mild Steel

Mild Steel is the common workhorse building material. All mild steels contain less than 0.3% carbon, but the varying amounts of other elements present give rise to the bewildering variety of available alloys. The stock lists of a large steel distributor will contain hundreds of available kinds of steel listed by numbers. The common ones which are obtainable in the greatest assortment of cross sections are numbers 1018 and 1020. If you don't otherwise specify you will probably get 1018. Both types will machine easily into simple shapes but tend to tear when being threaded. If there are many screws or studs to be made, try "12L14 plus tellurium," or "12L14 leaded."

1018 steel is available as either "hot rolled" or

"cold formed." Hot rolled is a little cheaper but is covered with a black scale. It can be used where the stock size is machined overall to produce the finished part or where you have the patience to file off the scale . . . or where you don't mind if the finished part has a black scale all over it. Cold formed has a nice smooth surface that only needs a coat of paint but, unfortunately, has stresses locked up in the metal from the forming process. Cutting a keyway there, for example, from cold formed unlocks these stresses and the finished part may bow into interesting but unwanted shapes. Annealing the metal prior to cutting prevents this distortion but it is difficult to do with large pieces. You have a choice: a properly shaped piece with an ugly scale or a nice, smooth surface which is the wrong shape.

In England they have a third choice. Hot rolled and cold formed are known there as "black" and "bright" steels, but they can also get "blue" steel. This is cold formed steel which has been annealed. They are lucky in England.

Carbon Steel

Generally speaking, this is a family of steels containing more than 0.3% but less than 1.7% carbon. Varieties of it are called "drill steel" and "tool steel," an English variety is called "silver steel." It is easy to heat-treat by methods available in the home workshop. In its annealed form it machines readily into a variety of small tools such as D-bits, counterbores and reamers. Hardened and tempered it becomes clean cutting, though not long wearing, tools.

High Speed Steel is a carbon steel containing a high percentage of tungsten — often with the addition of chromium, vanadium and cobalt. It has the property of retaining its hardness at red heat and is widely used for cutting tools. It is long wearing and it is in common use for drills, reamers, taps and dies and tool bits. It is almost impossible to anneal by home workshop methods and a small high speed tap which breaks off in the work can be a disaster. Stellite and Carbide steels are even more esoteric varieties which are used chiefly as tips on cutting tools.

Stainless Steel

In England it is called "rustless steel." These are a family of steels with low carbon content but containing ten to twenty per cent of chromium. Models have been built entirely of stainless steel. It would seem a waste to paint them! More often it is used only for those parts which would be particularly subject to rusting such as piston and valve rods. Again, catalogs list a confusing assortment of alloys. Perhaps in most common use is "type 303, free-machining," which contains some lead. Free-machining is a comparative term since they are all much more difficult than mild steel to machine.

Alloy Steels

These are medium or low carbon steels which also contain small percentages of manganese, silicon, chromium, molybdenum and sometimes nickel. They are remarkably versatile steels; they are very strong, can be heat treated by home workshop methods, can be used for small tools or intricate parts and are often used for such things as collets where hardness and long wear must go together. A useful variety is number 4140.

Monel

Pure nickel is seldom used in the home shop but the alloy of nickel and copper (which make up the chief ingredients of the monel metals) has attained some use, chiefly because of its resistance to corrosion. It makes an excellent boiler material and would be more popular except that it is more expensive than copper. The range of available tubing sizes is limited. Type 500 is the most easily rolled and flanged for boilers.

Duralumin

Duralumin is an aluminum-copper alloy which is stronger, harder and more machinable than pure aluminum. It resists corrosion but is very tricky to solder or weld. It is used chiefly where lightness is of extreme importance.

White Metal or Babbitt

A tin or lead base alloy which has a low melting point and is used chiefly as a bearing material. Old machine tools which had plain bearings often used babbitt for them. When the time came to rebuild the machine because of wear, new bearings could be poured as a home workshop method. You can't hardly get that stuff no more!

Zinc, magnesium and the "space age" metals are seldom used in model engineering.

Next month: *HEAT TREATMENT for the apprentice.*

The late Gene Hackley was a great help in the beginning days of LIVE STEAM Magazine as all of our readers will agree. From the very beginning he was anxious to assist, wanting to know what we needed or wanted in the way of pictures and articles for the new publication.

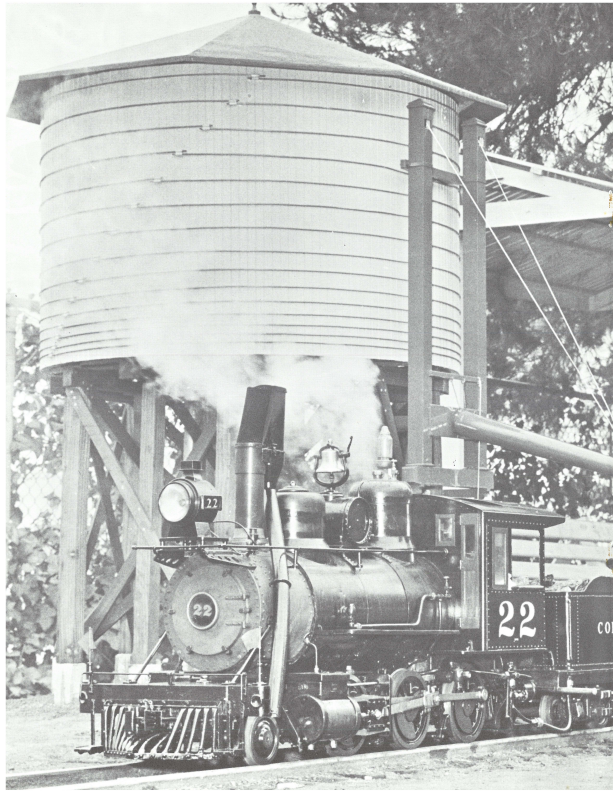
One day an extra-large envelope arrived in the mail and in it an extra-large photo and a note from Gene. It was one of his favorite pictures, he wrote, without any people in it to spoil the perspective. The picture shows Colorado & Southern 2–6–0 #22 and train at a water tank . . . and it takes a little study to realize that the picture was not taken at some remote water stop on the C&S, but at the Los Angeles Live Steamers' facility at Griffith Park. The engine, cars and water tank are the work of A. H. "Bud" Whitmer of Burbank, but the attractive Mogul has since become the property of C. Thomas Crawford of Pasadena.

The picture, Gene continued, was in anticipation of the day when LIVE STEAM would have the equipment to present this picture "double truck on the center spread."

We've reached that point with no small part of the credit due to Gene and others who have submitted a fine selection of photos for us to use.

We present the picture, Gene's favorite, in this issue as sort of a tribute or memorial to him . . . a superb photographer, a zealous Live Steamer and a revered friend.

— W. C. F. —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22
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LORADO & SOUTHERN

PATTERN POOL DEPOSIT INCREASED

In keeping with the current trend of all things monetary, the deposit on patterns withdrawn from the Live Steam Pattern Pool is going to have to be raised. Not that there has been any great increase in the cost of operating the Pattern Pool, but it seems that five bucks don't always weigh as heavily as they used to in "insuring the prompt return of patterns."

Effective immediately, the deposit required for patterns will be $10.00, which is still returned minus only postage and any handling, once all the patterns are returned in good condition. Please mark your copy of the list available so that it will be correct when you get to the point of using the patterns.

For those who may not be familiar with this program, a word of explanation: Walter Allen is "custodian" of a goodly supply of patterns for all sorts and sizes of steam projects. They are donated to the Pattern Pool by individuals who have used them for their own construction and have no further need for them. No charge is made for the use of the patterns, only a $10.00 deposit to assure their prompt return. It's a most generous gesture by those who have made available countless hours of patternmaking for our use without any charge.

Walt handles the storage, the correspondence and the cataloging without any reimbursement — and it's a small courtesy to ask that they be returned promptly.

If you don't have a copy of the latest list (#7) of the patterns available and are contemplating a Live Steam project, send 10¢ to Live Steam Pattern Pool at 962 Greenland in Portsmouth, N. H. 03801 along with a self-addressed #10 (business letter size) envelope with 12¢ postage.

Any way we look at it, it is a wonderful service that Walt offers and we are grateful for the generosity of the many donors to our cause.

"UNION PACIFIC STORY" AVAILABLE TO LIVE STEAMERS

Richard M. Winkle, President of the Southern Minnesota Live Steamers Association, has arranged for readers of LIVE STEAM Magazine to obtain a free copy of "The Union Pacific Story," a 40-page book which contains water color paintings by Howard Fogg, many of which appear on the Union Pacific's 1969 Centennial Calendar. Additional paintings by Mr. Fogg and others appear, plus old etchings and photos taken at the time of construction a hundred years ago.

To get your copy of this historical book, write

The Union Pacific Railroad
Public Relations Department
1416 Dodge Street
Omaha, Nebraska 68102

and tell them you read about it in LIVE STEAM Magazine.

July

12 ONTARIO SUNPARLOR
13 LINES
Grand Opening Run
3½" – 4½"
Jack Hart, Secretary
1381 Shepherd Street
Windsor, Ontario, Canada

19 MICHIGAN STEAM
LOCOMOTIVE CLUB
7½" gauge
Jack Spalding's track – Monroe
J. Bullock, Secretary
94 Basswood Drive
Davison, Michigan 48423

August

3 PALATINE, LAKE ZURICH
& WAUCONDA RAILROAD
2nd Anniversary Meet
4½" gauge
Frank Saville
512 Miller
Barrington, Ill. 60010
Phone 312 – 381-3070

9 SOUTHERN MINNESOTA
10 LIVE STEAMERS
3½" – 4½" – 7½"
Al O'Neil's track – Lake City
Richard M. Winkle, President
220 First Ave., S.W.
Rochester, Minn. 55901

30 PENNSYLVANIA LIVE
31 STEAMERS
1 Annual Fall Meet
2½" – 3½" – 4½"
Wm. H. Scott, Secretary
R.D. 1, Box 400
Sellersville, Pa., 18960

September

6 IOWA MODEL STEAM
7 ENGINEERS
Annual Fall Meet
Merching G. Scott, Secretary
R.F.D. 1
Newton, Iowa 52302

13 GOLDEN GATE LIVE
14 STEAMERS
Annual Fall Meet
2½" – 3½" – 4½" – 7½"
Gordon French, Secretary
614 18th Avenue
Menlo Park, Calif. 94025
Phone 415 – 325-4209

19 NEW JERSEY LIVE
20 STEAMERS
21 ADVANCE REGISTRATION
REQUIRED
3½" – 4½" – 7½"
Ralph Green, Secretary
845 Kilsyth Road
Elizabeth, N. J. 07208
Phone 201 – 353-4424

October

4 LOS ANGELES LIVE
5 STEAMERS
Annual Fall Meet
3½" – 4½" – 7½"
Joel Corbin, Secretary
12723 Kittridge Street
North Hollywood, Calif. 91606

11 PIONEER VALLEY LIVE
12 STEAMERS
13 3½" – 4½" – 7½"
Brenton W. Barnfather, Secy.
3 Fleetwood Drive
Sandy Hook, Conn. 06482

11 SOUTHERN MINNESOTA
12 LIVE STEAMERS
3½" – 4½" gauge
Al O'Neil's track – Lake City
Richard M. Winkle, President
220 First Ave., S.W.
Rochester, Minn. 55901

Regular Run Days

GOLDEN GATE LIVE
STEAMERS
Every Sunday, weather permitting
2½" – 3½" – 4½" – 7½"
Gordon French, Secretary
614 18th Avenue
Menlo Park, Calif. 94025
Phone 415 – 325-4209

JAMUL VALLEY RAILROAD
3rd Sunday each month
7½" gauge
Harry F. Haas
Route 1, Box 47A
Jamul, California 92035

NEW JERSEY LIVE STEAMERS
Each Sunday, May thru October
3½" – 4½" – 7½"
Ralph Green, Secretary
845 Kilsyth Road
Elizabeth, N. J. 07208
Phone 201 – 353-4424

PIONEER VALLEY LIVE
STEAMERS
2nd Sunday each month
3½" – 4½" – 7½"
Brenton W. Barnfather, Secretary
3 Fleetwood Drive
Sandy Hook, Conn. 06482

PENNSYLVANIA LIVE
STEAMERS
May 11, June 15, July 13,
Aug. 10, Sept. 14, Oct. 12
Wm. H. Scott, Secretary
R.D. 1, Box 400
Sellersville, Pa. 18960

LOS ANGELES LIVE STEAMERS
1st Sunday each month
3½" – 4½" – 7½"
Joel Corbin, Secretary
12723 Kittridge Street
North Hollywood, Calif. 91606

MONTREAL LIVE STEAMERS
1st Sunday of each month
3½" – 4½" – 7½" gauges
S. H. Galloway, Secretary
53 Brentwood Road
Beaurepaire, Quebec, Canada

RED RIVER VALLEY RAILWAY
Every Sunday, weather permitting
June – 1st through 20th
2½" – 3½" – 5" gauge
Paul Winslow, Secretary
304 – 1179 Grant Ave.
Winnipeg 21, Manitoba, Canada

RIVERSIDE LIVE STEAMERS
4th Saturday-Sunday each month
Hunter Park – Iowa & Columbia
Ave.
Riverside, California
Francis H. Smith, Secretary
5536 Davey Avenue
Riverside, California 92504
Phone 688-9533 or 683-9628

SOUTHERN CALIFORNIA LIVE
STEAMERS
3rd Sunday each month
3½" – 4½" – 7½"
K. G. Kepner, Secretary
2764 Maple
Rialto, California 92376

WABASH, FRISCO & PACIFIC
Every Sunday
12" gauge
Grand and First Streets
0.4 miles south of Post Office
Glencoe, Missouri

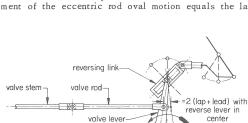
VALVE GEAR

THE HACKWORTH VALVE MOTION PRINCIPLE

This group of valve motions include valve motions that reverse and hook up by changing the angle of a fixed reversing link or by swinging the fulcrum of a radius bar to either side of center. Among the popular motions that used the Hackworth principle are the Hackworth, Marshall, Joy, Southern, and the Baker. Most of the above motions are variations in an attempt to create the perfect valve motion; some were reasonably successful and became popular. Other motions using the Hackworth principle were overly complicated monstrosities of galloping levers that kept the maintenance department busy. They will be ignored.

HACKWORTH MOTION (I) OF 1859. (The original Hackworth.)

This motion has a fixed reversing link mounted directly above the main axle (or crankshaft). The eccentric rod drives a link block in a straight link with a back-and-forth motion. The valve rod is connected to the eccentric rod at a point where the fore-and-aft movement of the eccentric rod oval motion equals the lap


reversing link
valve stem
valve rod
=2 (lap + lead) with reverse lever in center
valve lever eccentric
note: all motions shown here are direct acting and outside steam
crank pin
FIRST HACKWORTH VALVE MOTION (1859)

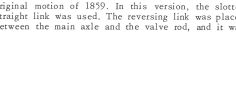
and lead (reverse lever in center). By moving the reverse lever from center, the inclination of the reversing link adds more fore-and-aft motion to the valve rods, giving more port opening. Swinging the reverse link in the opposite direction reverses the action. Since the reversing link is mounted directly above the axle, any vertical displacement of the axle seriously affects the valve events. Many variations of the Hackworth principle were attempts to correct this defect. The Southern and the Baker successfully corrected this problem.

HACKWORTH MOTION (II) OF 1859

This was Hackworth's second motion and is described here as the Marshall.

HACKWORTH MOTION OF 1876.

This motion was a modification of Hackworth's original motion of 1859. In this version, the slotted straight link was used. The reversing link was placed between the main axle and the valve rod, and it was

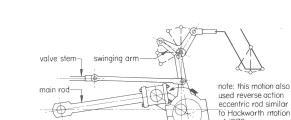


HACKWORTH VALVE MOTION (1876)

claimed that this arrangement gave a near perfect motion. However, due to high pressures in full gear, the wear on the link block was severe, and the problem of vertical displacement of the axle still existed.

MARSHALL VALVE MOTION

This valve motion is mostly known as the "Marshall." However, it is a direct copy of Hackworth's second motion, and was one of the causes of Hackworth's many infringement suits. The swinging arm (radius bar in the Baker) replaces the straight link of the original Hackworth motion. Reverse and hook-up is accomplished by swinging the fulcrum end of the radius bar to the opposite side. In common with all Hackworth principle valve motions, the Marshall Valve Motion is known as a radial valve gear since it provides constant lead for all positions of the reverse lever. It is to be noted that the arc of the radius bar creates a different pattern of movement at the end of the eccentric rod than does the link used in the original Hackworth motion (oval described by the upper end of the eccentric rod).


valve stem
swinging arm
main rod
note: this motion also used reverse action eccentric rod similar to Hackworth motion of 1876.

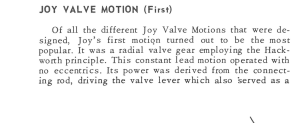
MARSHALL VALVE MOTION
COPY OF THE HACKWORTH SECOND MOTION

This creates a difference in valve events.

The problem of vertical displacement of the driving axle still existed with the locomotive. However, where the crankshaft was rigidly mounted as with the marine engine, the stationary engine, and the steam tractor, no problem of that kind existed. The British attempted to correct this problem on their locomotives by eliminating the equalizers where Hackworth valve motions were installed; however, it was merely robbing Peter to pay Paul.

JOY VALVE MOTION (First)

Of all the different Joy Valve Motions that were designed, Joy's first motion turned out to be the most popular. It was a radial valve gear employing the Hackworth principle. This constant lead motion operated with no eccentrics. Its power was derived from the connecting rod, driving the valve lever which also served as a



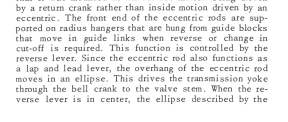
JOY'S FIRST MOTION

lap and lead lever. The upper end of the valve lever is controlled by a link block sliding in a curved link. The weak point of the Joy design is that the connecting rod has to be drilled for the coupler pin. Also, since it was based on the Hackworth principle, movement of the axle in a vertical plane affected the valve events with the locomotive working in full cut-off. The coupler is to correct errors in the motion that would arise if the valve lever was connected directly to the connecting rod. Theoretically, the Joy Motion gives better steam distribution than the other valve motions when properly set; that is, the cut-off can be equalized for both ends of the stroke. However, its undesirable features kept it from becoming popular.

The Joy Valve motion was used on the inside cylinder of the Philadelphia & Reading 3-cylinder Atlantics. The later models of the White Steamers used the Joy Valve Motion with success. The Doble Steamer also used a valve motion that was called a Joy. However, it was only a Joy as far as being driven from the connecting rod was concerned. The correcting coupler and the anchor link were missing. Also, it used a straight reversing link instead of a curved link that was characteristic of the Joy Motion. Actually, it was closer to the Hackworth Motion of 1876 except that the motion was not driven by an eccentric.

SOUTHERN VALVE MOTION

This valve motion received its name because it was first installed on locomotives of the Southern Railway where the patentee, William S. Brown was Chief Engineer. It was a copy of Stroug's second motion, except that it was mounted as an outside motion being driven by a return crank rather than inside motion driven by an eccentric. The front end of the eccentric rods are supported on radius hangers that are hung from guide blocks that move in guide links when reverse or change in cut-off is required. This function is controlled by the reverse lever. Since the eccentric rod also functions as a lap and lead lever, the overhang of the eccentric rod moves in an ellipse. This drives the transmission yoke through the bell crank to the valve stem. When the reverse lever is in center, the ellipse described by the



SOUTHERN VALVE MOTION

end of eccentric rod alings with the engine center line and gives only lap and lead. As the reverse lever is moved reward full forward, the radius hanger becomes canted at an angle, giving the ellipse a different form and also tipping its long axis to the engine center line, meanwhile adding more valve travel resulting in later cut-off. As the reverse lever is moved farther into reverse, the radius hanger swings in the opposite arc as it did in forward. This gives the end of the eccentric rod the opposite characteristics that it had with the reverse lever in forward, thereby reversing the locomotive. The Southern Valve Motion being a radial valve gear, gives constant lead which is typical of all Hackworth principle motions. Also, the lap and lead is based on the ratio of the two ends of the eccentric rod to the throw of the return crank.

This motion, since it is horizontal, is not affected by vertical movement of the main axle (typical of most Hackworth motions). Also, since there are no sliding surfaces, wear is kept to a minimum. For outside steam, the return crank leads the crankpin by 90° and, for inside steam (piston valves) the return crank follows the crankpin by 90°.

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Good reading for Live Steamers is found in a copy of the new "Hard To Find Tools" catalog of the Brookstone Company. All sorts of items that you will hardly ever find in a hardware store are shown and described in great detail and, very important, they can be returned if you are not satisfied in any way. Hand tools and machine tools for all sorts of applications, gauges for thickness and thread pitch, special saws, pliers, snips to assist Live Steamers in many of those special projects... these are only a few of the items illustrated.

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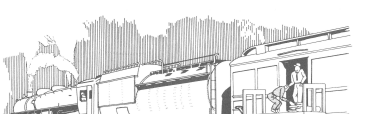

mail stop

A WORD TO THE WIVES IS SUFFICIENT

(We'd like to share this part of a letter from the wife of a Live Steamer. If two or more Live Steamers ever sit down to eat and even notice what is being served, they won't be surprised to find casserole meals or stew instead of steaks or chops! W. C. F.)

As to the idea you mentioned last fall that your wife wanted some recipe to bring men from the railroad hobby "work table" *promptly* to the "eating table," my opinion is that "there ain't no such animal!"

The recipe to look for is for a meal that will keep from 5:30 p.m. until the last loop has been run, the last bit of cleaning done on the steam engine, the last anecdote remembered, the last plan for a something-or-other discussed, the last dirty hand washed and all the stragglers seated at the table. *Then* serve the big dish and sit back. The praise will flow in like down-hill water!

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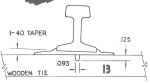

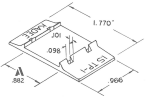

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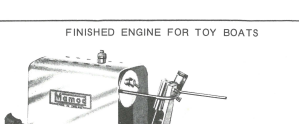

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